Future Opportunities for Soil Survey Information and Interpretations

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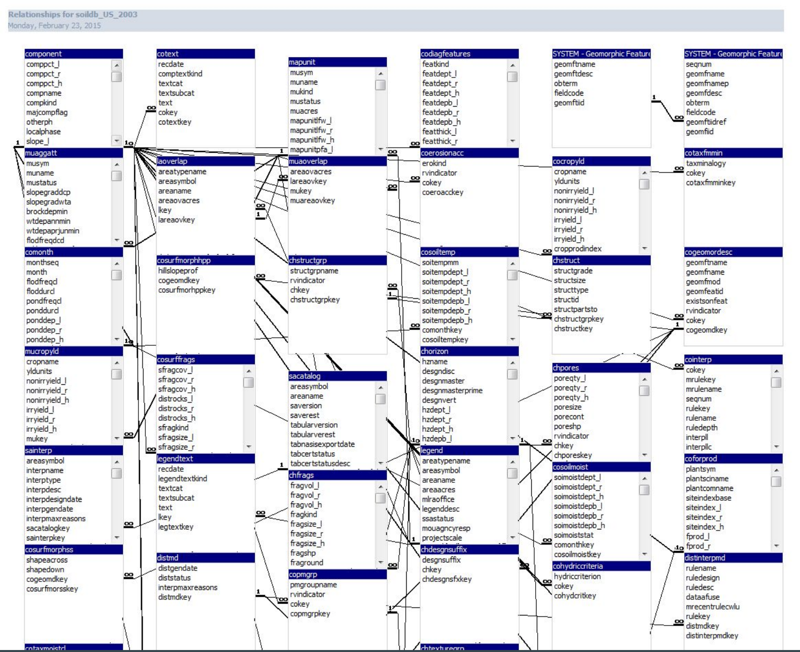
Outline

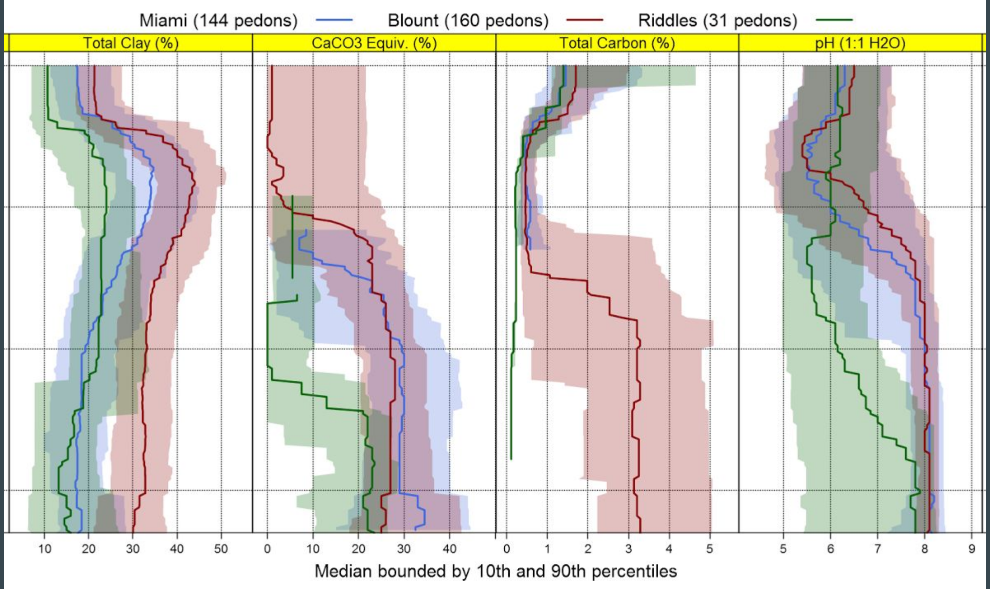
- Where are we?
  - Existing Soil Information
  - Existing Tools
- Who Is Our Competition ? - POLARIS & SoilGrids
- How Do We Move Forward ? - Raster Interpretation Workshops
  - Overview
  - Raster interpretation example
  - UC Davis and Extension groundwater recharge example
- Opportunities
- Questions

What does our soil data look like ? - the tables

Raw Tabular Format



Graphical Aggregate

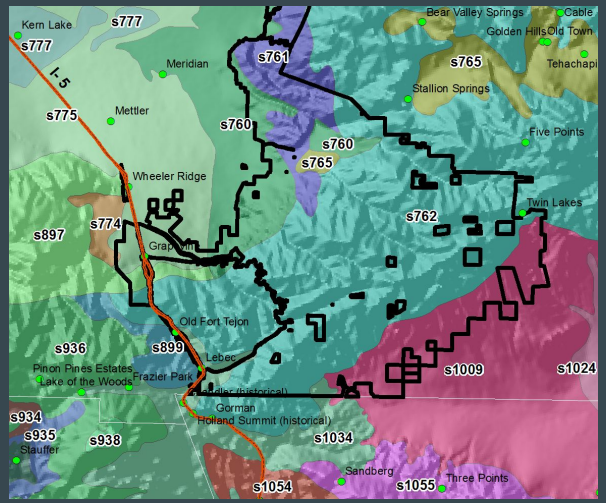


What does our soil data look like ? - the maps

Vector *(i.e. thematic)*

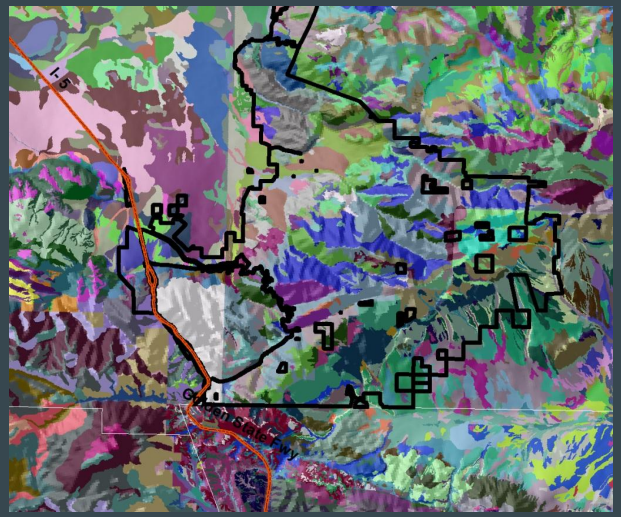
STATSGO2

1:250,000



SSURGO

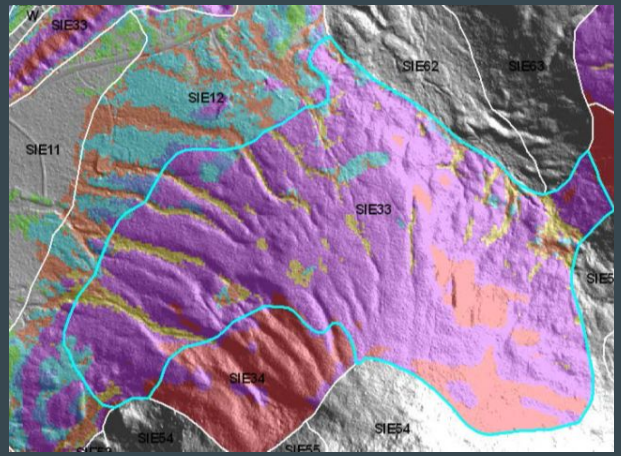
1:24,000



Raster

Digital Soil Map

(e.g. individual soil series or properties)



Comparison of (official) SSURGO derivatives

Interface	Ease of Use	Niche	Platform
SoilWeb	++	Fast web viewer	Browser / App
Web Soil Survey	+	It does everything	Brower
File Geodatabase	neutral	Desktop GIS	Desktop GIS
GlobalSoilMap	?	Modeling	?
Soil Data Access	-	Custom queries	Browser / REST / R
soilDB	-	Importing data	R

How do we make sense of soil data ?

Aggregate / Interpretations

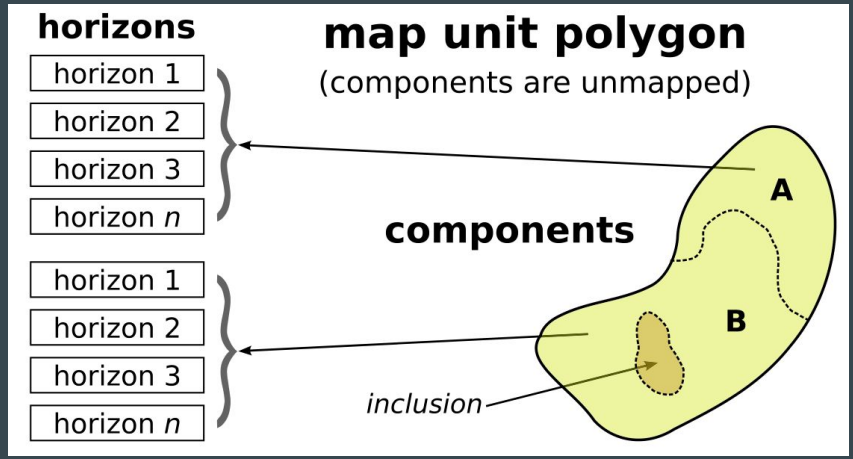
(component vs mapunit)

Numeric variables

- Weight average

Categorical variables

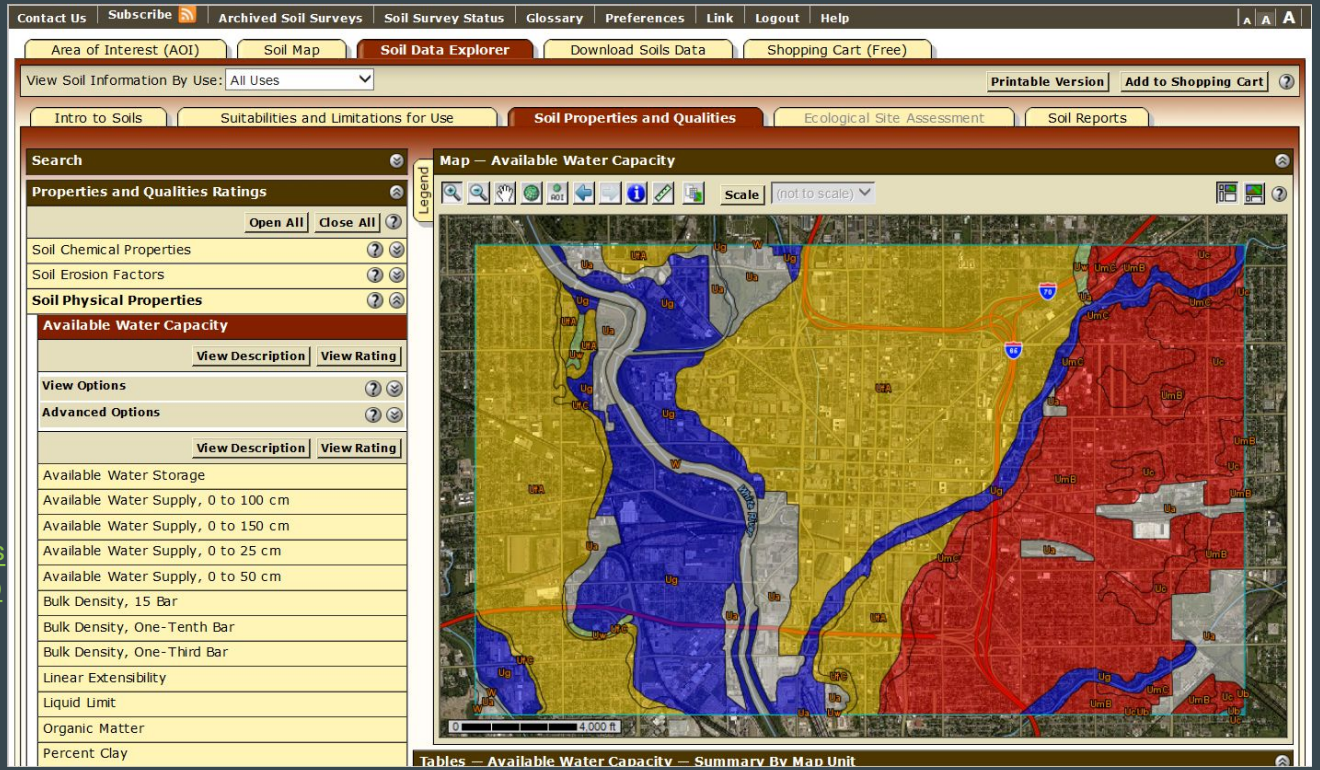
- Dominant component
- Dominant condition



SSURGO Interface - Web Soil Survey *(Flagship)*

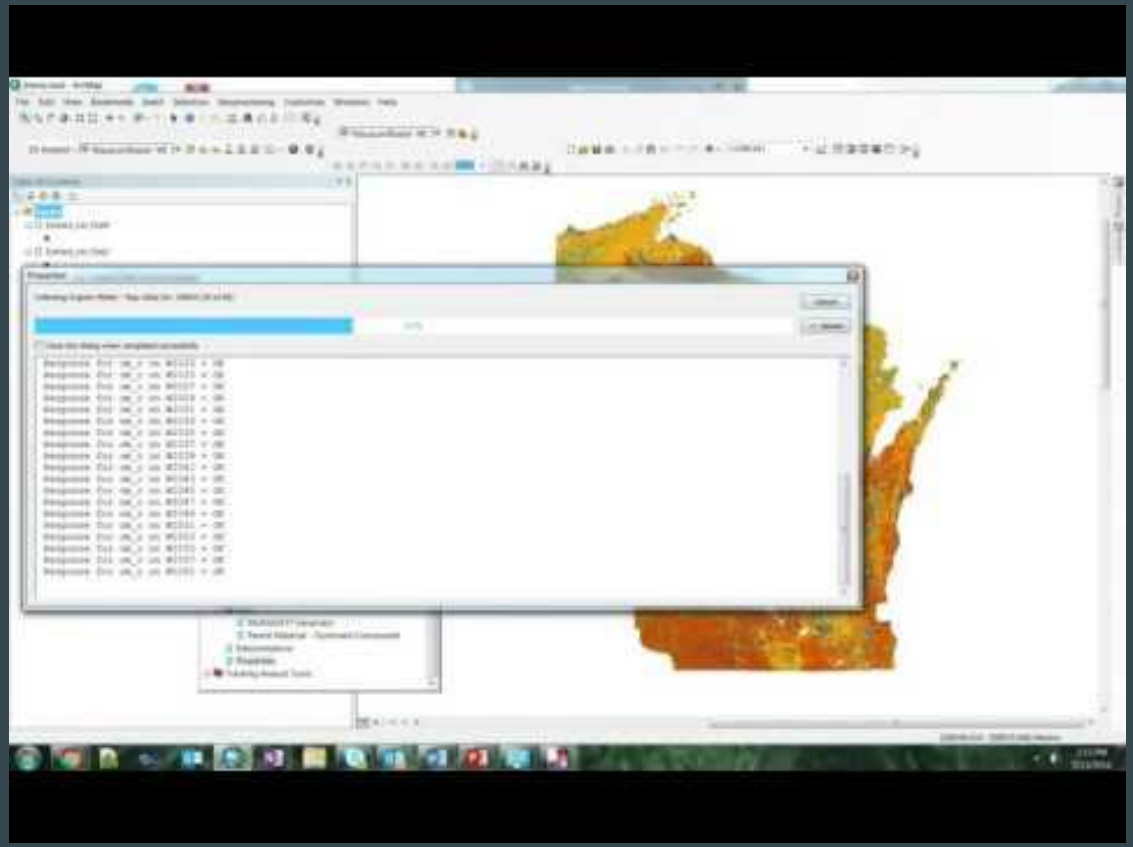
Useful features

- Access tabular data
- Generate soil interpretations
- Generates reports
- Create maps
- Download data
  (Shapefiles and MS Access database by County)
- http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx



gSSURGO OnDemand

- Generates a thematic map-fast!
- Tabular data sourced from SDA
- Joins intreps to gSSURGO
- Similar to Soil Data Viewer
- Works with massive data sets
- Developed by Chad Ferguson and Jason Nemecek



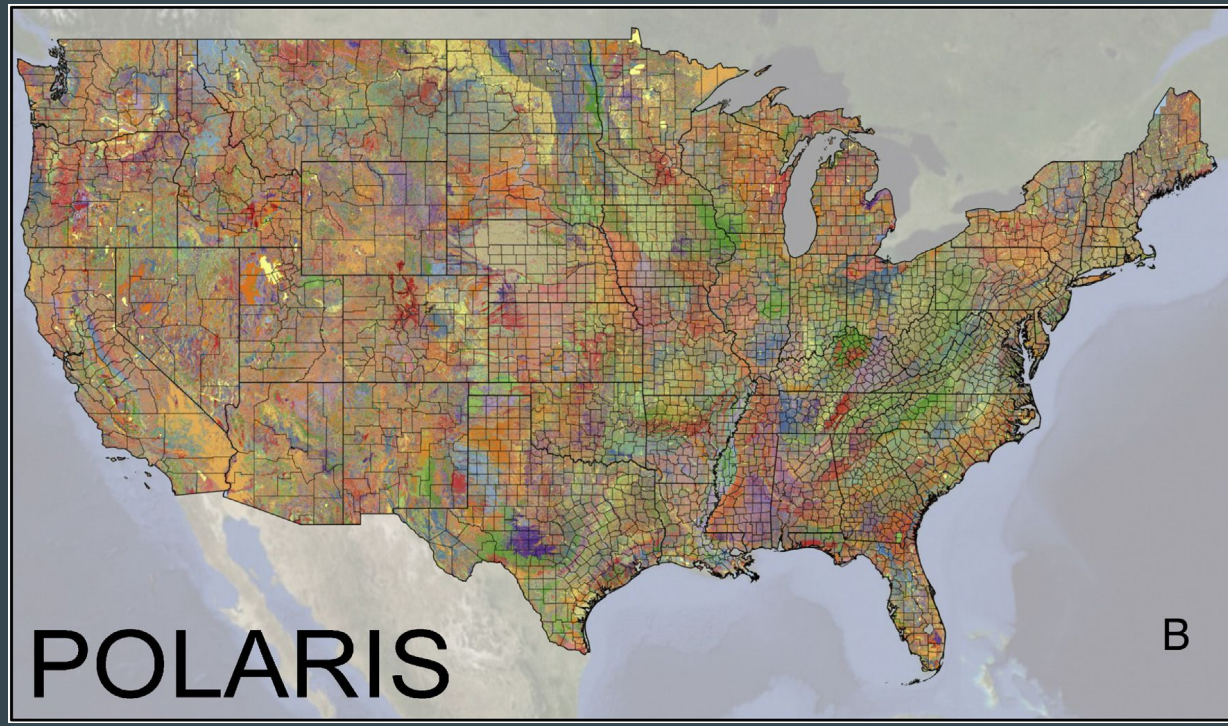
(Simple) Soil Data Grids: SSURGO/STATSGO

- This is the format MANY cooperators want
- Top 10-20 most requested properties
- Post as .tif or deliver via WMS
- Several scales: 250m, 800m, 4km
- gSSURGO derivatives
  - Holes filled with STATSGO
  - Properties / interpretations
  - Depth Intervals
  - Landform / parent material
- Not a replacement: new delivery of current data

Prototypes have been developed internally with existing tools.

Who Is Our Competition ? - POLARIS & SoilGrids

- We have competition (a good thing):
  - POLARIS: 30m grid of SSURGO component probabilities
  - SoilGrids: 250m grids of estimated soil properties
- Technology is making development easier (better???)
- Lack of similar NCSS product means that these data may be used inappropriately

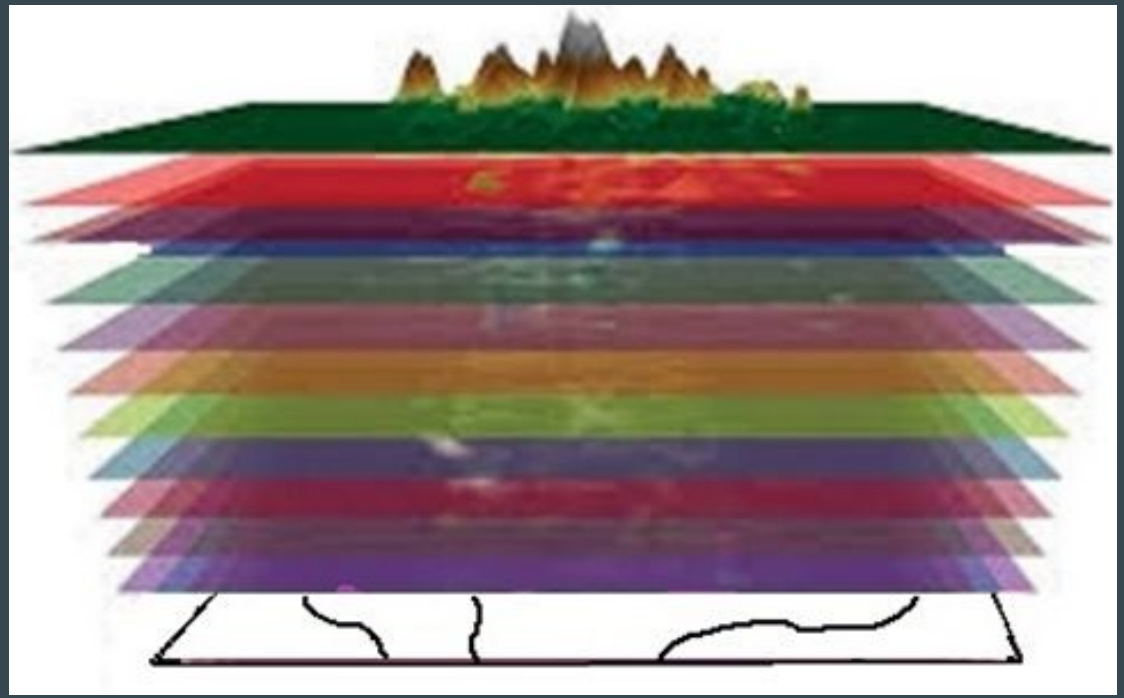


How Do We Move Forward ? - Raster Interpretation Workshops

1. Four workshops were held (Amherst, St. Paul, Davis, Temple).
2. Fill data gaps (Soils 2026 Initiative)
3. We need a new 'hybrid' interpretation *engine* (business requirements under development)
4. We need to be in more spaces (e.g. multiple projects, such as SoilWeb and ISEE)
5. Disaggregation SSURGO (long process)
6. We need to provide more COMPREHENSIVE information (e.g. dynamic soil properties, such as forecasts of soil moisture and alternative management scenarios)

- The 4 Cs Principle (Dr. Thompson):
    1. Complete (Initial) ->
    2. Consistent (SDJR) ->
    3. Correct (MLRA projects) ->
    4. Comprehensive (DSP)

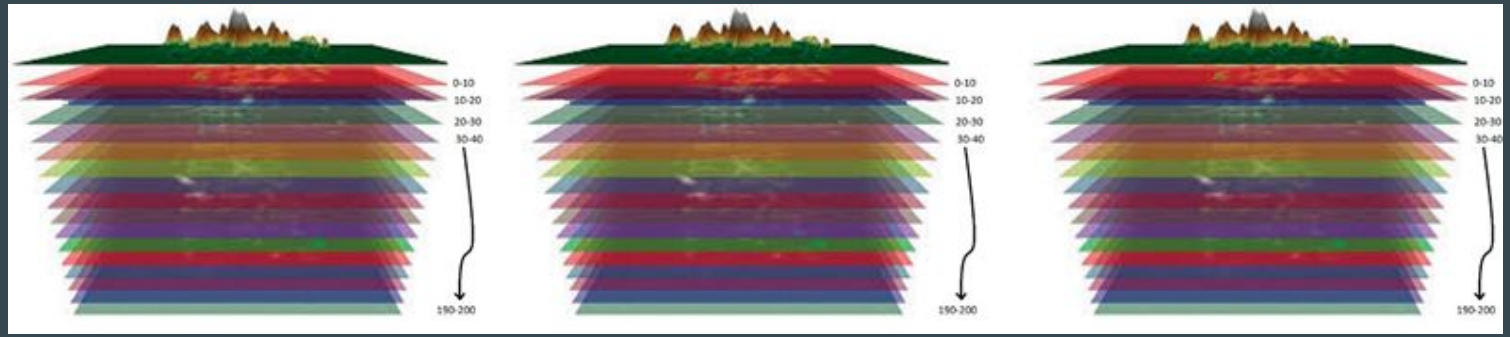
(Hybrid) Interpretations from Raster Data



Environmental Rasters

gSSURGO or gSTATSGO

(Hybrid) Interpretations from Raster Data



Rock Fragments

Clay

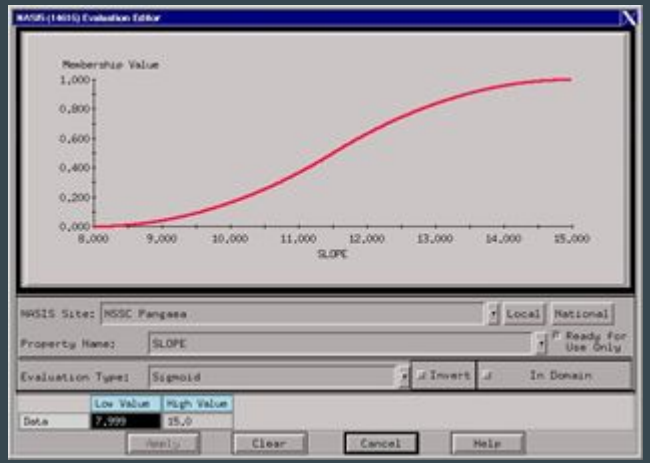
Carbon

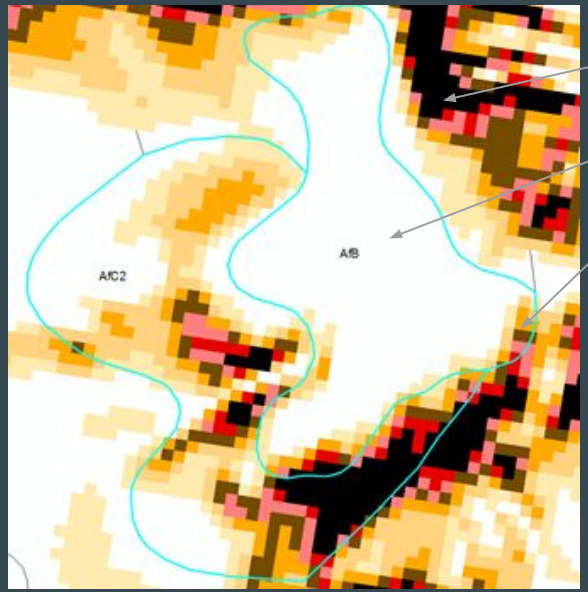
gSSURGO

- 0-10 cm
- 10-20 cm
- etc..

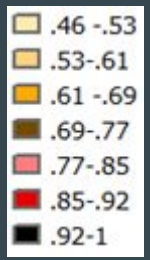
(Hybrid) Interpretations from Raster Data

Septic Tank Absorption for Alford silt loam - without slope, somewhat limited - soil water (0.47)
Slopes < 8% not limiting, membership = 0
Slopes > 15% severely limiting, membership = 1
Slopes between 8-15 range between 0-1 based on a sigmoidal membership function



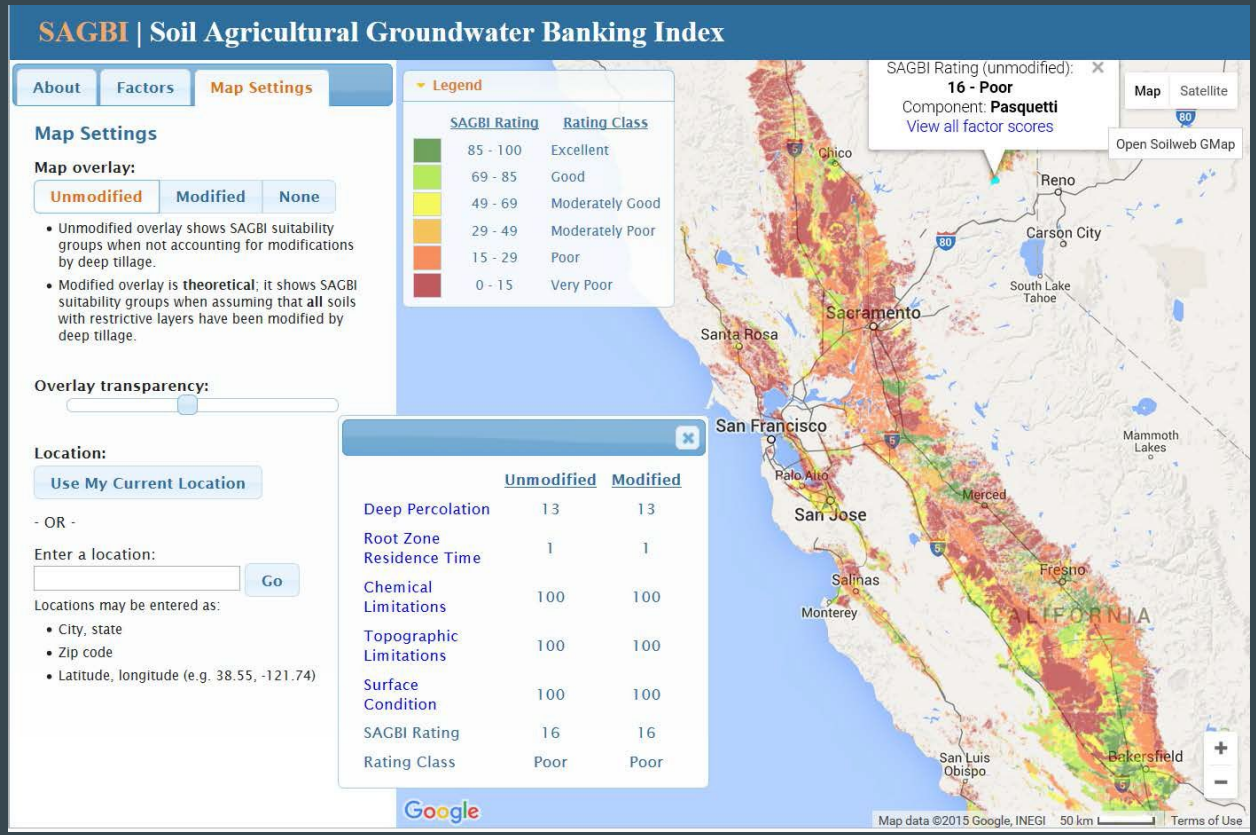


Severe - slope, slow water (>15% slope)
Somewhat limited - slow water (< 8% slope)
Areas of slope dependency (between 8-15% slope



Develop Relevant Interpretations

- Intrep developed by UC Davis and UC Cooperative Extension
- Perfect timing
- Generated lots of interest and public interviews



Future Opportunities - generally speaking

- Data
  - Leverage existing data and be smarter about collecting new data (we don't know how best to do this yet)
- Communication
  - Focus more on communicating existing data (typically we contract out this, should we?)
  - SoilWeb apps and ISEE provide good example
  - Provide (synthesize) our data into more informative / compatible formats
- Experimentation
  - We need to fail more (but limit duplicating failure) (Google and Amazon model)
  - Continue investment in (new) training (Shawn's YouTube videos are a good start)
  - Allot time for big ideas (when they pay off they pay off big)
- IT
  - We NEED additional software and server space to efficiently and rapidly adapt
  - Currently we're working with our hands tied

Future Opportunities - specific initiatives

- Easy Stuff
  - Develop new Interpretation Engine (that can incorporate other datasets)
  - Convert the OSDs into a true database
  - Collect new types of soil data (e.g. spectral, XRF, gamma radiometrics)
  - Update STATSGO (lots of people use this)
  - Normalization / correlation of geomorphic descriptions: critical to disaggregation
- Hard Stuff
  - Unify soil series / component concepts = simplified national palette of soils
  - Develop new delivery system for our soil data (flexibility is key)
  - Finish SSURGO - Soils 2026 Initiative (do it or die trying)
  - Examine approaches to disaggregate SSURGO
  - Develop forecasts (e.g. interpretations for dynamic soil properties)

Questions (?) We Need to Answer

- Who are Our Customers?
  - Other agencies, Precision Ag, Modelers, Homeowners
- There is lots to do, what do we tackle?
  - MLRA projects or Initiatives? Are we up for more Initiatives? What can we afford not to do?
- How do we make time?
  - We need to work ~~faster~~ more efficiently
- Do we need MORE money?
  - We need more KNOW HOW!
- Who should do what? (FOs, ROs, SOs, Lincoln, D.C., ?)
  - Whoever knows how or has interest! Reimagine Employee Organization.
- How do we manage updates?
- Do we simply convert SSURGO to a raster, or do we create a NEW product?
  - Some offer a persuasive argument that we need to make the map blank again.